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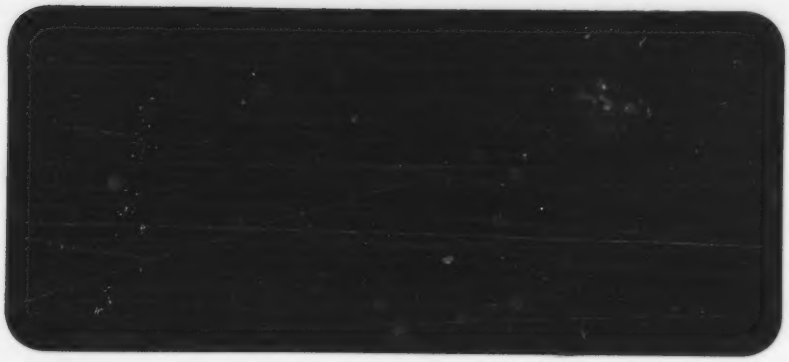

ENVIRONMENT CANADA
CONSERVATION AND PROTECTION
ENVIRONMENTAL PROTECTION
PACIFIC AND YUKON REGION

BASELINE MONITORING

VESTMIN RESOURCES LTD
SILBAK PREMIER MINE
- August 9, 1988 -

REGIONAL DATA REPORT DR 90-01

By

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and
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January 1990

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1.0 Introduction

The Premier Gold project is located in the Salmon River drainage system. The mine is located on the east side of the Cascade Creek valley, about 1 km upstream of the border. The Premier Gold mine site is drained by Cooper Creek to the north and west while the drainage at the south part of the mine is by Fletcher Creek. Both creeks join above the Granduc road to form Fletcher Creek, which flows into Cascade Creek immediately below the falls (Figure 1). The falls on Cascade Creek are an impassable barrier to salmon migration. Cascade Creek joins the Salmon River about 1.5 km downstream (Figure 2). Salmon River supports chum, pink, and coho salmon, and the occasionnal sockeye salmon.

The company is developing an open pit mine. A cyanide leach is used to extract gold and silver. The tailings pond is located in the Cascade Creek valley. The upper part of the Cascade Creek has been diverted to the Lesley Creek channel. The tailings will be discharged using the subaerial technique and the supernatant discharged to Cascade Creek above the falls.

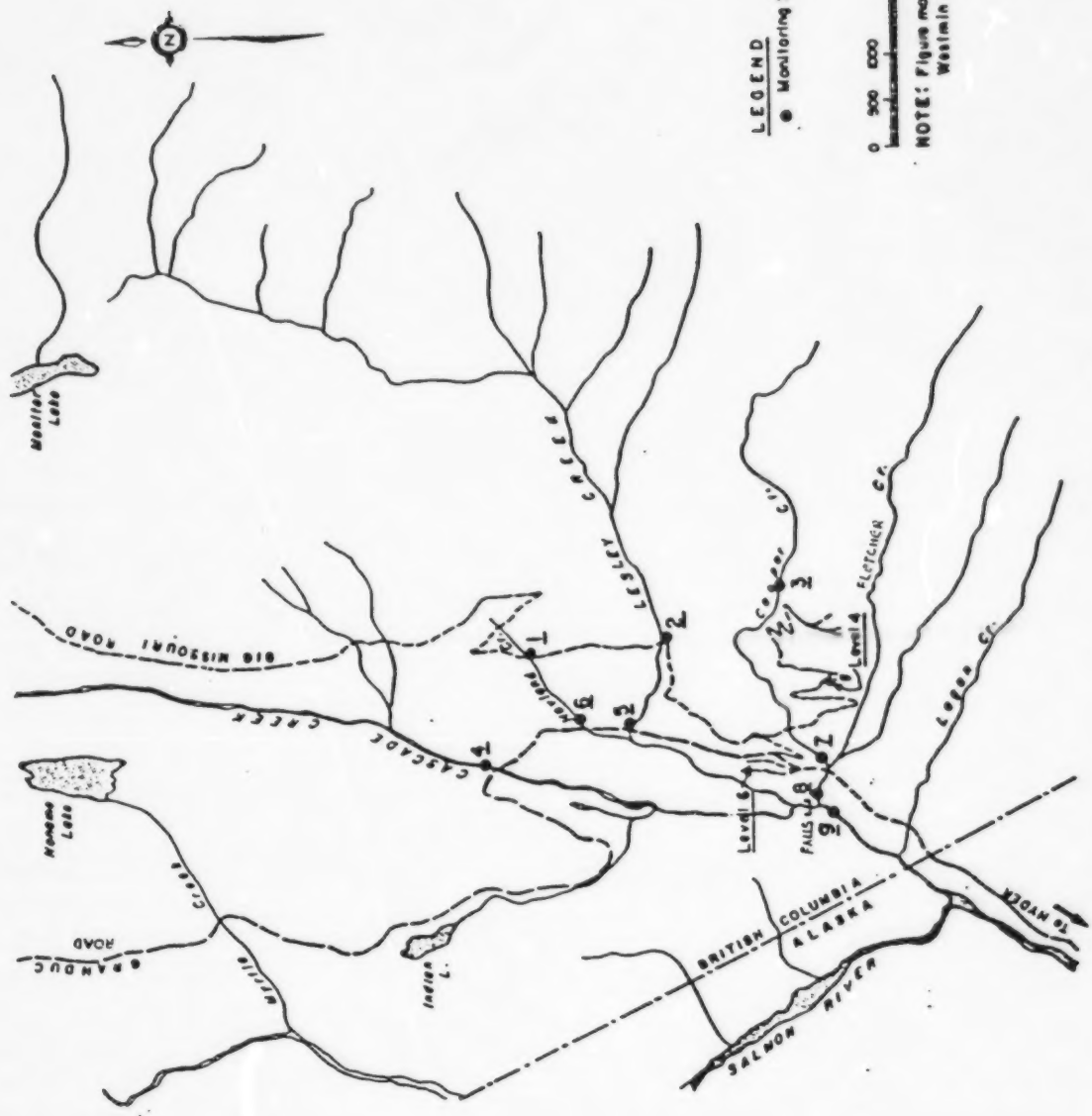


FIGURE 1 RECEIVING WATER SAMPLING STATIONS

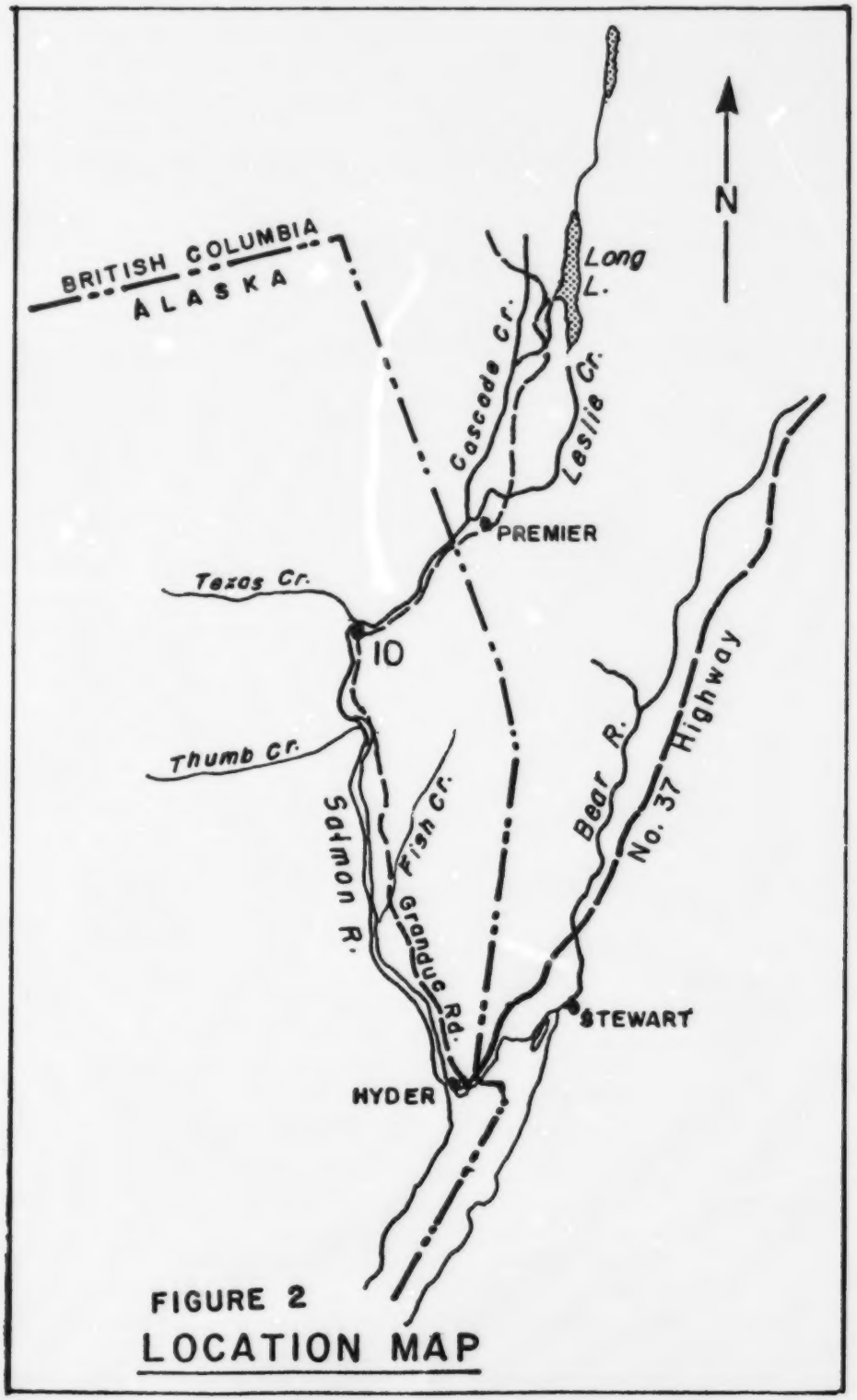


FIGURE 2
LOCATION MAP

2.0 SITE DESCRIPTION

STATION	LOCATION
2	Lesley Creek upstream of the mill
3	Cooper Creek upstream of the open pit
4	Cascade Creek upstream of the tailings pond
5	Lesley Creek downstream of the mill
7	Cooper Creek downstream of the open pit
9	Cascade Creek downstream of the tailings pond
10	Salmon River at mile 14
Level #4	Mine portal
Level #6	Mine portal

3.0 MATERIAL AND METHODS

The mine site was visited on August 9, 1988. No flow measurements were taken at the sampling stations. Water chemistry samples were collected at eight stations. The same numbering of the stations was used as in the previous baseline water quality report (Godin 1988). Sediment samples were collected at the same eight sites and at Station 10 on the Salmon River. The following chemical parameters were analysed: alkalinity, pH, conductivity, total residue, non filterable residue, and sulphate. These samples were kept cool with ice until analysed. Dissolved metals were filtered the same day through a 0.45 micron cellulose nitrate membrane filter. Total and dissolved metals were preserved with nitric acid (0.5 ml/100 ml of sample). All samples were collected with clean polyethelene bottles. The bottles for metal samples were previously acid washed. The hardness was determined from the dissolved metal sample.

Inductively Coupled Argon Plasma (ICP) was used for the total and dissolved metal analysis and gave a reading of twenty-six metals. For cadmium, copper, and lead the samples were re-analysed with the graphite furnace when the values were below two times the detection limit on the ICAP procedure. For analytical methods details refer to the Environment Canada Pacific Region Environmental Laboratory Manual (Anon., 1979).

Sediment samples were collected from the streambed below the water level, with a clean acrylic corer. Four replicates were taken at each site. The samples were transferred into kraft bags and kept cool until analysed. The samples were air dryed, sieved to <150 um, digested with aqua regia, and analysed for heavy metals using ICP. A portion of the sediments were also ignited at 550°C in a muffle furnace. The loss of weight was reported as volatile residue and the remaining residue was reported as fixed residue.

4.0 RESULTS

The water metal results can be found in Table 1, while the other water quality results are found in Table 2. The sediment data are reported in Table 3.

Orange staining on the streambed of Cooper Creek at Station 7 observed in the 1987 inspection was not present in 1988. This may be related to increase in flow during freshet. The higher flows may have washed away the accumulated precipitate. Stations 7 and 9 on Cooper Creek and Cascade Creek respectively, indicated increases in non-filterable residue, both in comparison to the other stations sampled in 1988 and Stations 7 and 9 from survey 1987. Several metals were elevated at the downstream Station 9, compared to 1987's survey, such as: Ba, Fe, Mn, Pb, and Zn. Cadmium was elevated at most stations compared to last year. Sulphate was only elevated at Station 7 downstream of the level #4 mine portal.

Water quality at the two mine portals showed higher total metal concentrations for Al, Cd, Cu, Fe, Mn, Pb, Zn, and higher dissolved metals for Cd, and Zn compared to last year's survey. The non-filterable residues were higher at Level #6 while the sulphate concentration was higher at Level #4.

Sediment analysis generally showed no statistical differences between Lesley Creek Station 2 and 5 except for arsenic where elevated concentrations were found at Station 2 the upstream site. For all statistical differences, the reader is referred to Figures 3 to 5 for multiple comparison plots and Table 4 for statistical station separations. Metal concentrations at Station 7, the downstream site on Cooper Creek, were significantly higher than Station 3, the upstream site, for Cu, Hg, Pb, and Zn. No significant differences were found between Station 4 and 9, on Cascade Creek, for trace metals. High variability in cadmium content measurements prevent an evaluation of differences even though high levels were found at Station 7.

Table 1

Water Quality, Metal Analysis
Silbak Premier - August 9, 1988

Station Number		TOTICP AG MG/L	DISICP AG MG/L	TOTICP AL MG/L	DISICP AL MG/L	TOTICP AS MG/L	DISICP AS MG/L	TOTICP BA MG/L	DISICP BA MG/L	TOTICP CA MG/L	DISICP CA MG/L	TOTICP CD MG/L	TOTGF CD MG/L	DISICP CD MG/L	DISGF CD MG/L	TOTICP CO MG/L	DISICP CO MG/L	TOTICP CR MG/L	DISICP CR MG/L
	Repl.1	<.01	<.01	0.06	<.05	<.05	<.05	0.042	0.039	7.9	7.4	<.005	<.0001	<.005	<.0001	<.005	<.005	<.005	<.005
2	Repl.2	<.01	<.01	0.07	<.05	<.05	<.05	0.044	0.039	8.3	7.4	<.005	0.0001	<.005	<.0001	<.005	<.005	<.005	<.005
	Repl.3	<.01	<.01	0.09	<.05	<.05	<.05	0.041	0.039	7.7	7.4	<.005	0.0001	<.005	<.0001	<.005	<.005	<.005	<.005
	Average	---	---	0.07	---	---	---	0.042	0.039	8.0	7.4	---	0.0001	---	---	---	---	---	---
	S.D.	---	---	0.02	---	---	---	0.002	0.000	0.3	0.0	---	0.0000	---	---	---	---	---	---
	Repl.1	<.01	<.01	<.05	<.05	<.05	<.05	0.152	0.152	12.0	11.6	<.005	<.0001	<.005	<.0001	<.005	<.005	<.005	<.005
3	Repl.2	<.01	<.01	<.05	<.05	<.05	<.05	0.155	0.145	12.3	11.2	<.005	<.0001	<.005	<.0001	<.005	<.005	<.005	<.005
	Repl.3	<.01	<.01	<.05	<.05	<.05	<.05	0.146	0.143	11.7	11.1	<.005	<.0001	<.005	<.0001	<.005	<.005	<.005	<.005
	Average	---	---	---	---	---	---	0.151	0.147	12.0	11.3	---	---	---	---	---	---	---	---
	S.D.	---	---	---	---	---	---	0.005	0.005	0.3	0.3	---	---	---	---	---	---	---	---
	Repl.1	<.01	<.01	0.15	<.05	<.05	<.05	0.013	0.008	3.8	3.5	<.005	0.0001	<.005	<.0001	<.005	<.005	<.005	<.005
4	Repl.2	<.01	<.01	0.11	<.05	<.05	<.05	0.013	0.010	4.0	3.7	<.005	0.0002	<.005	0.0001	<.005	<.005	<.005	<.005
	Repl.3	<.01	<.01	0.15	<.05	<.05	<.05	0.013	0.010	3.9	3.6	<.005	0.0002	<.005	0.0002	<.005	<.005	<.005	<.005
	Average	---	---	---	---	---	---	0.013	0.009	3.9	3.6	---	0.0002	---	0.0002	<.005	<.005	<.005	<.005
	S.D.	---	---	---	---	---	---	0.000	0.001	0.1	0.1	---	0.0001	---	0.0001	---	---	---	---
	Repl.1	<.01	<.01	0.26	<.05	<.05	<.05	0.050	0.039	8.6	7.7	<.005	0.0002	<.005	0.0003	<.005	<.005	<.005	<.005
5	Repl.2	<.01	<.01	0.28	<.05	<.05	<.05	0.050	0.039	8.7	7.7	<.005	0.0005	<.005	0.0005	<.005	<.005	<.005	<.005
	Repl.3	<.01	<.01	0.21	<.05	<.05	<.05	0.046	0.040	8.1	7.8	<.005	<0.0005	<.005	0.0006	<.005	<.005	<.005	<.005
	Average	---	---	0.25	---	---	---	0.049	0.039	8.5	7.7	---	0.0004	---	0.0005	---	---	---	---
	S.D.	---	---	0.04	---	---	---	0.002	0.001	0.3	0.1	---	0.0002	---	0.0002	---	---	---	---
	Repl.1	<.01	<.01	1.02	0.07	<.05	<.05	0.142	0.101	24.0	23.3	<.005	0.0022	<.005	0.0022	<.005	<.005	<.005	<.005
7	Repl.2	<.01	<.01	1.17	<.05	<.05	<.05	0.155	0.102	25.7	23.7	<.005	0.0025	<.005	0.0024	<.005	<.005	<.005	<.005
	Repl.3	<.01	<.01	1.14	0.09	<.05	<.05	0.156	0.103	26.1	23.6	<.005	0.0028	<.005	0.0026	0.006	<.005	<.005	<.005
	Average	---	---	1.11	0.08	---	---	0.151	0.102	25.3	23.5	---	0.0025	---	0.0024	---	---	---	---
	S.D.	---	---	0.08	0.01	---	---	0.008	0.001	1.1	0.2	---	0.0003	---	0.0002	---	---	---	---
	Repl.1	<.01	<.01	1.10	<.05	<.05	<.05	0.053	0.023	6.4	5.8	<.005	0.0004	<.005	0.0002	0.005	<.005	<.005	<.005
9	Repl.2	<.01	<.01	1.01	<.05	<.05	<.05	0.049	0.022	6.2	5.7	<.005	0.0004	<.005	0.0003	<.005	<.005	<.005	<.005
	Repl.3	<.01	<.01	1.24	<.05	<.05	<.05	0.053	0.023	6.5	5.8	<.005	0.0004	<.005	0.0003	0.008	<.005	<.005	<.005
	Average	---	---	1.12	---	---	---	0.052	0.023	6.4	5.8	---	0.0004	---	0.0003	0.007	---	---	---
	S.D.	---	---	0.12	---	---	---	0.002	0.001	0.2	0.1	---	0.0000	---	0.0001	0.002	---	---	---
Level #4		<.01	<.01	0.27	<.05	<.05	<.05	0.072	0.029	71.7	68.9	0.021	---	0.017	0.0096	0.006	<.005	<.005	<.005
Level #6		0.02	<.01	2.97	<.05	<.05	<.05	0.601	0.039	80.9	75.5	0.103	---	0.060	---	0.062	<.005	<.005	<.005

Table 1 (cont.)

Water Quality, Metal Analysis
Silbak Premier - August 9, 1988

Station Number		TOTICP CU MG/L	TOTGF CU MG/L	DISICP CU MG/L	DISGF CU MG/L	TOTICP FE MG/L	DISICP FE MG/L	TOTICP MG MG/L	DISICP MG MG/L	TOTICP MN MG/L	DISICP MN MG/L	TOTICP MO MG/L	DISICP MO MG/L	TOTICP NA MG/L	DISICP NA MG/L	TOTICP NI MG/L	DISICP NI MG/L	TOTICP P MG/L	DISICP P MG/L
	Repl.1	<.005	<.0005	<.005	<.0005	0.064	<.005	1.0	1.0	0.004	<.001	<.01	<.01	0.3	0.3	<.02	<.02	<.1	<.1
2	Repl.2	<.005	<.0005	<.005	<.0005	0.062	<.005	1.1	0.9	0.004	<.001	<.01	<.01	0.3	0.2	<.02	<.02	<.1	<.1
	Repl.3	<.005	<.0005	<.005	<.0005	0.103	<.005	1.0	1.0	0.004	<.001	<.01	<.01	0.3	0.2	<.02	<.02	<.1	<.1
	Average	---	---	---	---	0.076	---	1.0	1.0	0.004	---	---	---	0.3	0.2	---	---	---	---
	S.D.	---	---	---	---	0.023	---	0.1	0.1	0.000	---	---	---	0.0	0.1	---	---	---	---
	Repl.1	<.005	<.0005	<.005	<.0005	<.005	<.005	0.9	0.9	<.001	<.001	<.01	<.01	0.5	0.5	<.02	<.02	<.1	<.1
3	Repl.2	<.005	<.0005	<.005	<.0005	<.005	<.005	0.9	0.9	<.001	<.001	<.01	<.01	0.5	0.5	<.02	<.02	<.1	<.1
	Repl.3	<.005	<.0005	<.005	<.0005	0.059	<.005	0.9	0.9	0.001	<.001	<.01	<.01	0.5	0.5	<.02	<.02	<.1	<.1
	Average	---	---	---	---	---	---	0.9	0.9	---	---	---	---	0.5	0.5	---	---	---	---
	S.D.	---	---	---	---	---	---	0.0	0.0	---	---	---	---	0.0	0.0	---	---	---	---
	Repl.1	<.005	<.0005	<.005	<.0005	0.167	<.005	0.5	0.3	0.012	0.002	<.01	<.01	0.3	<.1	<.02	<.02	<.1	<.1
4	Repl.2	<.005	0.0021	<.005	<.0005	0.148	0.005	0.5	0.5	0.012	0.003	<.01	<.01	0.2	0.2	<.02	<.02	<.1	<.1
	Repl.3	<.005	0.0026	<.005	<.0005	0.164	<.005	0.5	0.5	0.011	0.003	<.01	<.01	0.2	0.2	<.02	<.02	<.1	<.1
	Average	---	0.0024	---	---	0.160	---	0.5	0.4	0.012	0.003	---	---	0.2	0.2	---	---	---	---
	S.D.	---	0.0004	---	---	0.010	---	0.0	0.1	0.001	0.001	---	---	0.1	0.0	---	---	---	---
	Repl.1	<.005	<.0005	<.005	<.0005	0.234	<.005	1.1	1.0	0.026	0.013	<.01	<.01	0.3	0.3	<.02	<.02	<.1	<.1
5	Repl.2	<.005	0.0007	<.005	<.0005	0.246	<.005	1.1	1.0	0.026	0.013	<.01	<.01	0.4	0.3	<.02	<.02	<.1	<.1
	Repl.3	<.005	<.0005	<.005	<.0005	0.204	<.005	1.0	1.0	0.025	0.013	<.01	<.01	0.3	0.3	<.02	<.02	<.1	<.1
	Average	---	---	---	---	0.228	---	1.1	1.0	0.026	0.013	---	---	0.3	0.3	---	---	---	---
	S.D.	---	---	---	---	0.022	---	0.1	0.0	0.001	0.000	---	---	0.1	0.0	---	---	---	---
	Repl.1	0.007	0.0043	<.005	0.0008	1.010	0.032	1.6	1.4	0.094	0.047	<.01	<.01	0.9	0.8	<.02	<.02	<.1	<.1
7	Repl.2	0.008	0.0046	<.005	0.0010	1.120	0.033	1.7	1.4	0.102	0.048	<.01	<.01	0.9	0.7	<.02	<.02	<.1	<.1
	Repl.3	<.005	0.0046	<.005	0.0008	1.110	0.031	1.8	1.5	0.103	0.048	<.01	<.01	1.0	0.7	<.02	<.02	<.1	<.1
	Average	0.0075	0.0045	---	0.0009	1.080	0.032	1.7	1.4	0.100	0.048	---	---	0.9	0.7	---	---	---	---
	S.D.	0.00071	0.0002	---	0.0001	0.061	0.001	0.1	0.1	0.005	0.001	---	---	0.1	0.1	---	---	---	---
	Repl.1	<.005	<.0005	<.005	<.0005	1.080	0.016	0.8	0.6	0.098	0.015	<.01	<.01	0.3	0.3	<.02	<.02	<.1	<.1
9	Repl.2	<.005	<.0005	<.005	<.0005	0.953	0.022	0.8	0.6	0.074	0.016	<.01	<.01	0.4	0.3	<.02	<.02	<.1	<.1
	Repl.3	<.005	<.0005	<.005	<.0005	1.180	0.021	0.9	0.6	0.074	0.015	<.01	<.01	0.4	0.3	<.02	<.02	<.1	<.1
	Average	---	---	---	---	1.071	0.020	0.8	0.6	0.082	0.015	---	---	0.4	0.3	---	---	---	---
	S.D.	---	---	---	---	0.114	0.003	0.1	0.0	0.014	0.001	---	---	0.1	0.0	---	---	---	---
Level #4		0.039	-	0.007	0.0066	1.210	<.005	5.0	4.9	0.473	0.292	<.01	<.01	2.3	2.2	<.02	<.02	<.1	<.1
Level #6		0.332	-	<.005	0.0047	10.900	<.005	7.2	6.5	0.924	0.456	<.01	<.01	9.3	8.5	<.02	<.02	<.1	<.1

Table 1 (cont.)

Water Quality, Metal Analysis
Silbak Premier - August 9, 1988

Station Number		TOTICP PB MG/L	TOTGF PB MG/L	DISICP PB MG/L	DISGF PB MG/L	DISICP SI MG/L	TOTICP SI MG/L	TOTICP SN MG/L	DISICP SN MG/L	TOTICP SR MG/L	DISICP SR MG/L	TOTICP TI MG/L	DISICP TI MG/L	TOTICP V MG/L	DISICP V MG/L	TOTICP ZN MG/L	DISICP ZN MG/L
	Repl.1	<.05	<0.0005	<.05	<.0005	0.54	0.61	<.05	<.05	0.062	0.060	<.002	<.002	<.01	<.01	<.002	<.002
2	Repl.2	<.05	<0.0005	<.05	<.0005	0.53	0.63	<.05	<.05	0.065	0.061	<.002	<.002	<.01	<.01	<.002	<.002
	Repl.3	<.05	<0.0005	<.05	<.0005	0.54	0.66	<.05	<.05	0.060	0.060	<.002	<.002	<.01	<.01	<.002	<.002
	Average	---	---	---	---	0.54	0.63	---	---	0.062	0.060	---	---	---	---	---	---
	S.D.	---	---	---	---	0.01	0.03	---	---	0.003	0.001	---	---	---	---	---	---
	Repl.1	<.05	<0.0005	<.05	<.0005	1.12	1.15	<.05	<.05	0.086	0.087	<.002	<.002	<.01	<.01	<.002	<.002
3	Repl.2	<.05	<0.0005	<.05	<.0005	1.09	1.18	<.05	<.05	0.088	0.083	<.002	<.002	<.01	<.01	<.002	<.002
	Repl.3	<.05	<0.0005	<.05	<.0005	1.09	1.15	<.05	<.05	0.083	0.082	<.002	<.002	<.01	<.01	<.002	<.002
	Average	---	---	---	---	1.10	1.16	---	---	0.086	0.084	---	---	---	---	---	---
	S.D.	---	---	---	---	0.02	0.02	---	---	0.003	0.003	---	---	---	---	---	---
	Repl.1	<.05	<0.0005	<.05	<.0005	0.39	0.60	<.05	<.05	0.034	0.034	<.002	<.002	<.01	<.01	<.002	<.002
4	Repl.2	<.05	0.0019	<.05	<.0005	0.47	0.57	<.05	<.05	0.036	0.035	<.002	0.002	<.01	<.01	<.002	<.002
	Repl.3	<.05	0.0011	<.05	<.0005	0.44	0.60	<.05	<.05	0.035	0.034	<.002	<.002	<.01	<.01	<.002	<.002
	Average	---	0.0015	---	---	0.43	0.59	---	---	0.035	0.034	---	---	---	---	---	---
	S.D.	---	0.0006	---	---	0.04	0.02	---	---	0.001	0.001	---	---	---	---	---	---
	Repl.1	<.05	<0.0005	<.05	<.0005	0.54	0.93	<.05	<.05	0.068	0.062	0.002	<.002	<.01	<.01	<.002	<.002
5	Repl.2	<.05	<0.0005	<.05	<.0005	0.57	0.95	<.05	<.05	0.068	0.062	0.004	<.002	<.01	<.01	<.002	<.002
	Repl.3	<.05	<0.0005	<.05	<.0005	0.56	0.82	<.05	<.05	0.063	0.063	<.002	<.002	<.01	<.01	<.002	<.002
	Average	---	---	---	---	0.56	0.90	---	---	0.066	0.062	0.003	---	---	---	---	---
	S.D.	---	---	---	---	0.02	0.07	---	---	0.003	0.001	0.001	---	---	---	---	---
	Repl.1	<.05	0.0031	<.05	<.0005	1.32	2.40	<.05	<.05	0.177	0.178	0.014	<.002	<.01	<.01	0.242	0.182
7	Repl.2	<.05	0.0033	<.05	<.0005	1.34	2.68	<.05	<.05	0.193	0.182	0.017	<.002	<.01	<.01	0.255	0.186
	Repl.3	<.05	0.0030	<.05	<.0005	1.32	2.69	<.05	<.05	0.196	0.183	0.016	<.002	<.01	<.01	0.258	0.185
	Average	---	0.0031	---	---	1.33	2.59	---	---	0.189	0.181	0.016	---	---	---	0.252	0.184
	S.D.	---	0.0002	---	---	0.01	0.16	---	---	0.010	0.003	0.002	---	---	---	0.009	0.002
	Repl.1	<.05	0.0015	<.05	<.0005	0.56	1.82	<.05	<.05	0.054	0.052	0.015	<.002	<.01	<.01	0.026	0.013
9	Repl.2	<.05	0.0012	<.05	<.0005	0.55	1.69	<.05	<.05	0.052	0.050	0.013	<.002	<.01	<.01	0.026	0.015
	Repl.3	<.05	0.0012	<.05	<.0005	0.55	2.11	<.05	<.05	0.056	0.052	0.018	<.002	<.01	<.01	0.028	0.013
	Average	---	0.0013	---	---	0.55	1.87	---	---	0.054	0.051	0.015	---	---	---	0.027	0.014
	S.D.	---	0.0002	---	---	0.01	0.22	---	---	0.002	0.001	0.003	---	---	---	0.001	0.001
Level #4		0.06	0.0160	<.05	<.0005	2.17	2.41	<.05	<.05	0.753	0.756	0.003	<.002	<.01	<.01	2.020	1.620
Level #6		1.90	---	<.05	<.0005	2.56	6.03	<.05	<.05	2.010	1.990	0.035	<.002	<.01	<.01	8.910	4.470

Table 2

Water Quality, Immediate Analysis
Silbak Premier - August 9, 1988

Station Number		ALK HC MG/L	DISICP HT MG/L	DISICP MG/L	COND UMHO/CM	TR MG/L	NFR MG/L	PH REL.U.	SO4 MG/L
	Repl.1	20.5	22.4	22.5	46.0	33	<5	7.7	3
2	Repl.2	20.0	22.4	22.3	53.0	34	<5	7.7	3
	Repl.3	20.0	22.3	22.5	47.0	33	<5	7.7	3
	Average	20.2	22.4	22.4	48.7	33	--	7.7	3
	S.D.	0.3	0.1	0.1	3.8	1	--	0.0	0
	Repl.1	31.5	32.8	32.8	63.0	38	<5	7.9	1
3	Repl.2	31.0	31.6	31.6	68.0	42	<5	7.9	2
	Repl.3	31.0	31.5	31.5	65.0	44	<5	7.9	1
	Average	31.2	32.0	32.0	65.3	41	--	7.9	1
	S.D.	0.3	0.7	0.7	2.5	3	--	0.0	1
	Repl.1	10.0	10.1	9.7	26.0	20	<5	7.4	3
4	Repl.2	10.0	11.5	11.7	26.0	16	<5	7.4	3
	Repl.3	11.0	11.1	11.2	28.0	24	<5	7.4	3
	Average	10.3	10.9	10.9	26.7	20	--	7.4	3
	S.D.	0.6	0.7	1.0	1.2	4	--	0.0	0
	Repl.1	20.5	23.2	23.4	65.0	38	<5	7.6	3
5	Repl.2	21.0	23.4	23.6	47.0	32	<5	7.7	3
	Repl.3	21.0	23.7	23.8	46.5	30	<5	7.7	3
	Average	20.8	23.4	23.6	52.8	33	--	7.7	3
	S.D.	0.3	0.3	0.2	10.5	4	--	0.1	0
	Repl.1	46.5	64.1	65.1	123.0	120	18	8.0	19
7	Repl.2	47.5	65.1	65.9	125.0	105	19	7.9	15
	Repl.3	46.5	64.9	65.9	123.0	107	19	8.0	16
	Average	46.8	64.7	65.6	123.7	111	19	8.0	17
	S.D.	0.6	0.5	0.5	1.2	8	1	0.1	2
	Repl.1	15.0	16.9	17.1	39.5	46	18	7.4	4
9	Repl.2	15.0	17.0	17.4	36.5	44	16	7.5	3
	Repl.3	15.0	16.9	17.2	44.5	42	17	7.5	4
	Average	15.0	16.9	17.2	40.2	44	17	7.5	4
	S.D.	0.0	0.1	0.2	4.0	2	1	0.1	1
Level #4	17	98.8	192.0	196.0	340.0	253	7	8.3	83
Level #6	18	101.0	215.0	225.0	400.0	367	76	8.2	110

Table 3

Sediment Quality, Metal Analysis
Silbak Premier - August 9, 1988

Station Number		AG UG/G	AL UG/G	AS UG/G	BA UG/G	BE UG/G	CA UG/G	CD UG/G	CO UG/G	CR UG/G	CU UG/G	FE UG/G	HG UG/G	MG UG/G	MN UG/G
	Repl.1	<2	22500	87	383	0.6	5500	1	<20	18.3	32.6	46900	0.07	7610	1530
	Repl.2	<2	18000	57	388	0.5	6160	<.8	<20	29.6	36.0	46100	0.06	7900	1490
2	Repl.3	<2	19100	88	586	0.5	18900	2	<20	19.6	54.2	40300	0.10	6640	1900
	Repl.4	<2	17700	96	417	0.5	19300	1	<20	14.0	53.5	41900	0.07	6880	1510
	Average	--	19325	82	444	0.5	12465	1	---	20.4	44.1	43800	0.08	7258	1608
	S.D.	--	2201	17	96	0.0	7668	1	---	6.6	11.4	3202	0.02	595	196
	Repl.1	3	25700	65	1020	0.7	8530	<.8	<20	11.0	34.1	57400	0.09	7480	2450
	Repl.2	3	24700	52	826	0.6	8590	1	<20	19.9	30.8	57600	0.06	7550	2260
3	Repl.3	<2	29400	60	1020	0.7	8060	<.8	<20	13.0	35.6	61000	0.09	7240	2300
	Repl.4	3	25000	60	867	0.7	7390	<.8	<20	14.0	32.4	57200	0.10	7500	2170
	Average	3	26200	59	933	0.7	8143	--	---	14.5	33.2	58300	0.09	7443	2295
	S.D.	0	2174	5	102	0.0	555	--	---	3.8	2.1	1807	0.02	138	117
	Repl.1	2	16200	90	584	0.5	3680	2	<20	31.3	53.5	50200	0.19	7510	1890
	Repl.2	2	21500	100	873	0.7	3790	2	20	44.9	57.4	56700	0.29	8590	2000
4	Repl.3	2	17300	110	697	0.5	3590	2	<20	36.1	55.1	52800	0.29	7710	1700
	Repl.4	2	19800	110	793	0.6	3930	6	<20	43.7	131.0	55500	0.41	8360	2280
	Average	2	18700	103	737	0.6	3748	3	---	39.0	74.3	53800	0.30	8043	1968
	S.D.	0	2399	10	125	0.1	147	2	---	6.4	37.9	2902	0.09	515	242
	Repl.1	3	15900	39	163	0.4	3560	<.8	<20	13.0	27.7	36900	0.04	7590	908
	Repl.2	2	16400	34	179	0.4	3720	<.8	<20	12.0	27.5	37200	0.04	7560	1080
5	Repl.3	2	16200	47	180	0.4	3480	<.8	<20	14.0	19.7	35900	0.04	7630	3020
	Repl.4	<2	16100	48	151	0.4	3450	<.8	<20	13.0	19.2	34800	0.03	7610	898
	Average	2	16150	42	168	0.4	3553	--	---	13.0	23.5	36200	0.04	7598	1477
	S.D.	1	208	7	14	0.0	121	--	---	0.8	4.7	1086	0.00	30	1032
	Repl.1	<2	15500	85	1110	0.3	10300	13	<20	10.0	182.0	51300	0.59	5980	1770
	Repl.2	<2	13200	91	828	0.3	11900	6	<20	8.3	96.4	52700	0.44	5680	1430
7	Repl.3	<2	12500	85	729	0.2	12800	5	<20	7.8	90.6	48900	0.39	5530	1330
	Repl.4	<2	12400	73	813	0.3	12500	5	<20	8.0	63.4	45500	0.41	5550	1350
	Average	--	13400	84	870	0.3	11875	7	---	8.5	108.1	49600	0.46	5685	1470
	S.D.	--	1445	8	166	0.0	1115	4	---	1.0	51.3	3152	0.09	208	205
	Repl.1	<2	15000	150	378	0.4	4630	8	<20	15.0	142.0	89100	0.20	7390	1870
	Repl.2	<2	13500	110	365	0.4	5350	5	<20	14.0	92.9	79300	0.42	7220	1190
9	Repl.3	<2	13600	150	384	0.4	4320	4	<20	16.0	119.0	91500	0.22	7280	1250
	Repl.4	3	16400	92	455	0.5	6070	6	<20	15.0	68.0	61100	0.29	7410	1510
	Average	--	14625	126	396	0.4	5093	6	---	15.0	105.5	80250	0.28	7325	1455
	S.D.	--	1367	29	40	0.0	782	2	---	0.8	32.0	13814	0.10	90	310
	Repl.1	<2	15100	62	152	0.3	13300	<.8	<20	24.7	72.7	38100	0.05	8480	803
	Repl.2	<2	12300	49	114	0.3	11600	<.8	<20	19.5	53.1	31000	0.03	7420	700
10	Repl.3	<2	12600	39	117	0.3	13800	<.8	<20	20.4	65.1	31600	0.03	7680	718
	Repl.4	<2	12900	79	113	0.2	11700	<.8	<20	28.0	71.7	44500	0.02	7530	655
	Average	--	13225	57	124	0.3	12600	--	---	23.2	65.7	36300	0.03	7778	719
	S.D.	--	1274	17	19	0.0	1117	--	---	4.0	9.0	6342	0.01	480	62

Table 3 (cont.)

Sediment Quality. Metal Analysis
Silbak Premier - August 9, 1988

		MO UG/G	NA UG/G	NI UG/G	P UG/G	PB UG/G	SI UG/G	SN UG/G	SR UG/G	TI UG/G	V UG/G	ZN UG/G	SFR MG/KG	SVR MG/KG
	Repl.1	10	100	22	1000	69	830	10	43.0	380	64	202	965000	34900
	Repl.2	10	100	36	1100	130	608	44	43.4	358	65	227	978000	22000
2	Repl.3	9	100	21	1200	110	638	10	97.2	348	47	251	958000	42200
	Repl.4	10	100	10	1100	85	631	<8	99.3	358	51	227	974000	26400
	Average	10	100	22	1100	99	677	21	70.7	361	57	227	968750	31375
	S.D.	1	0	11	82	27	103	20	31.8	14	9	20	8995	8986
	Repl.1	10	190	10	1400	21	770	<8	77.5	188	78	153	863000	137000
	Repl.2	10	230	20	1300	50	735	10	65.7	227	69	277	877000	123000
3	Repl.3	10	190	10	1400	25	840	<8	79.8	366	88	218	865000	135000
	Repl.4	10	160	10	1300	30	769	<8	68.6	256	79	198	889000	111000
	Average	10	193	13	1350	32	779	--	72.9	259	79	212	873500	126500
	S.D.	0	29	5	58	13	44	--	6.8	76	8	51	12042	12042
	Repl.1	10	70	43	1200	174	670	23	36.4	66	33	362	978000	21700
	Repl.2	10	100	62	1300	198	693	21	48.5	91	45	413	974000	26400
4	Repl.3	10	70	48	1300	150	634	20	39.0	64	35	403	979000	21500
	Repl.4	10	100	51	1300	823	700	26	45.1	73	41	927	980000	20500
	Average	10	85	51	1275	336	674	23	42.3	74	39	526	977750	22525
	S.D.	0	17	8	50	325	30	3	5.5	12	6	268	2630	2636
	Repl.1	7	70	17	930	33	516	<8	29.0	457	56	112	985000	14500
	Repl.2	7	70	23	870	35	536	<8	29.6	405	52	123	981000	18800
5	Repl.3	9	70	17	880	59	577	<8	29.7	441	53	105	983000	16600
	Repl.4	9	80	20	890	30	591	<8	29.5	441	53	102	982000	18400
	Average	8	73	19	893	39	555	--	29.5	436	54	111	982750	17075
	S.D.	1	5	3	26	13	35	--	0.3	22	2	9	1708	1965
	Repl.1	10	80	10	1200	1120	719	<8	76.3	705	52	3050	972000	27500
	Repl.2	10	60	10	1300	642	642	<8	73.8	630	50	2110	981000	18900
7	Repl.3	10	60	9	1200	586	590	<8	71.1	562	45	1650	983000	16900
	Repl.4	10	60	9	1200	538	547	<8	72.0	528	42	1540	985000	15400
	Average	10	65	10	1225	722	625	--	73.3	606	47	2088	980250	19675
	S.D.	0	10	1	50	269	74	--	2.3	78	5	688	5737	5410
	Repl.1	20	100	20	1200	1260	941	<8	36.3	462	75	987	979000	21000
	Repl.2	20	80	10	1300	403	749	15	36.8	570	84	696	980000	20000
9	Repl.3	17	90	19	1200	1110	943	20	34.8	533	81	724	981000	19200
	Repl.4	10	100	16	1200	239	618	8	46.6	565	70	825	971000	28700
	Average	17	93	16	1225	753	813	14	38.6	533	78	808	977750	22225
	S.D.	5	10	5	50	507	159	6	5.4	50	6	132	4573	4379
	Repl.1	10	370	17	1200	45	669	<8	69.0	1440	98	243	987000	13100
	Repl.2	9	180	10	1100	36	633	<8	55.5	1070	76	194	989000	10700
10	Repl.3	9	200	20	1100	34	662	<8	64.8	1230	81	223	990000	10100
	Repl.4	10	190	20	1100	50	632	<8	57.5	1250	110	168	989000	11400
	Average	10	235	17	1125	41	649	--	61.7	1248	91	207	988750	11325
	S.D.	1	90	5	50	8	19	--	6.3	152	16	33	1258	1297

Table 3 (cont.)

Sediment Quality, Metal Analysis
Silbak Premier - August 9, 1988

Station Number		AG UG/G	AL UG/G	AS UG/G	BA UG/G	BE UG/G	CA UG/G	CD UG/G	CO UG/G	CR UG/G	CU UG/G	FE UG/G	HG UG/G	MG UG/G	MN UG/G
	Repl.1	2	21400	130	1680	0.9	16600	194	60	17.0	1850.0	83900	4.50	4860	15600
	Repl.2	2	18900	120	1220	0.7	25600	230	40	28.8	4300.0	102000	4.20	3720	7640
Level	Repl.3	2	21000	120	1290	0.8	11900	148	40	16.6	1650.0	81600	6.20	5370	8910
#4	Repl.4	2	20600	130	1460	0.8	15000	197	60	16.0	2390.0	81200	4.20	4760	13800
	Average	2	20475	125	1413	0.8	17275	192	50	19.6	2547.5	87175	4.78	4678	11488
	S.D.	0	1100	6	205	0.1	5883	34	12	6.1	1209.4	9955	0.96	692	3817
	Repl.1	<2	18000	110	701	0.4	8530	75	<20	16.7	732.0	61200	1.10	7630	3690
	Repl.2	<2	16200	96	571	0.3	8210	70	<20	15.0	757.0	61500	1.20	7640	2850
Level	Repl.3	<2	15600	87	574	0.2	7240	75	<20	14.0	805.0	68300	1.30	7540	3130
#6	Repl.4	<2	15800	77	562	0.3	7500	52	<20	16.4	518.0	53800	0.66	7980	2020
	Average	--	16400	93	602	0.3	7870	68	---	15.5	703.0	61200	1.07	7698	2923
	S.D.	--	1095	14	66	0.1	601	11	---	1.3	127.0	5923	0.28	194	696

Table 3 (cont.)

Sediment Quality, Metal Analysis
Silbak Premier - August 9, 1988

		MO UG/G	NA UG/G	NI UG/G	P UG/G	PB UG/G	SI UG/G	SN UG/G	SR UG/G	TI UG/G	V UG/G	ZN UG/G	SFR MG/KG	SVR MG/KG
	Repl.1	34	100	40	1300	6620	1060	10	114.0	144	35	16900	963000	36800
	Repl.2	27	100	60	1100	8160	1090	140	133.0	202	38	26600	867000	133000
Level	Repl.3	29	100	37	1200	6230	1470	36	89.2	171	39	16100	962000	37700
84	Repl.4	40	100	23	1200	6780	1220	37	105.0	150	34	17500	957000	42800
	Average	33	100	40	1200	6948	1210	56	110.3	167	37	19275	937250	62575
	S.D.	6	0	15	82	841	187	58	18.3	26	2	4917	46907	47024
	Repl.1	19	100	10	1200	2250	927	17	95.0	730	65	9540	960000	40000
	Repl.2	20	100	10	1100	2600	1020	10	73.5	672	60	9780	982000	18300
	Repl.3	20	90	10	1200	3040	1270	<8	66.0	652	68	10100	982000	18400
Level	Repl.4	16	100	10	1100	1530	855	<8	65.4	731	67	7460	982000	18400
86	Average	19	98	10	1150	2355	1018	14	75.0	696	65	9220	976500	23775
	S.D.	2	5	0	58	638	181	5	13.8	40	4	1196	11000	10817

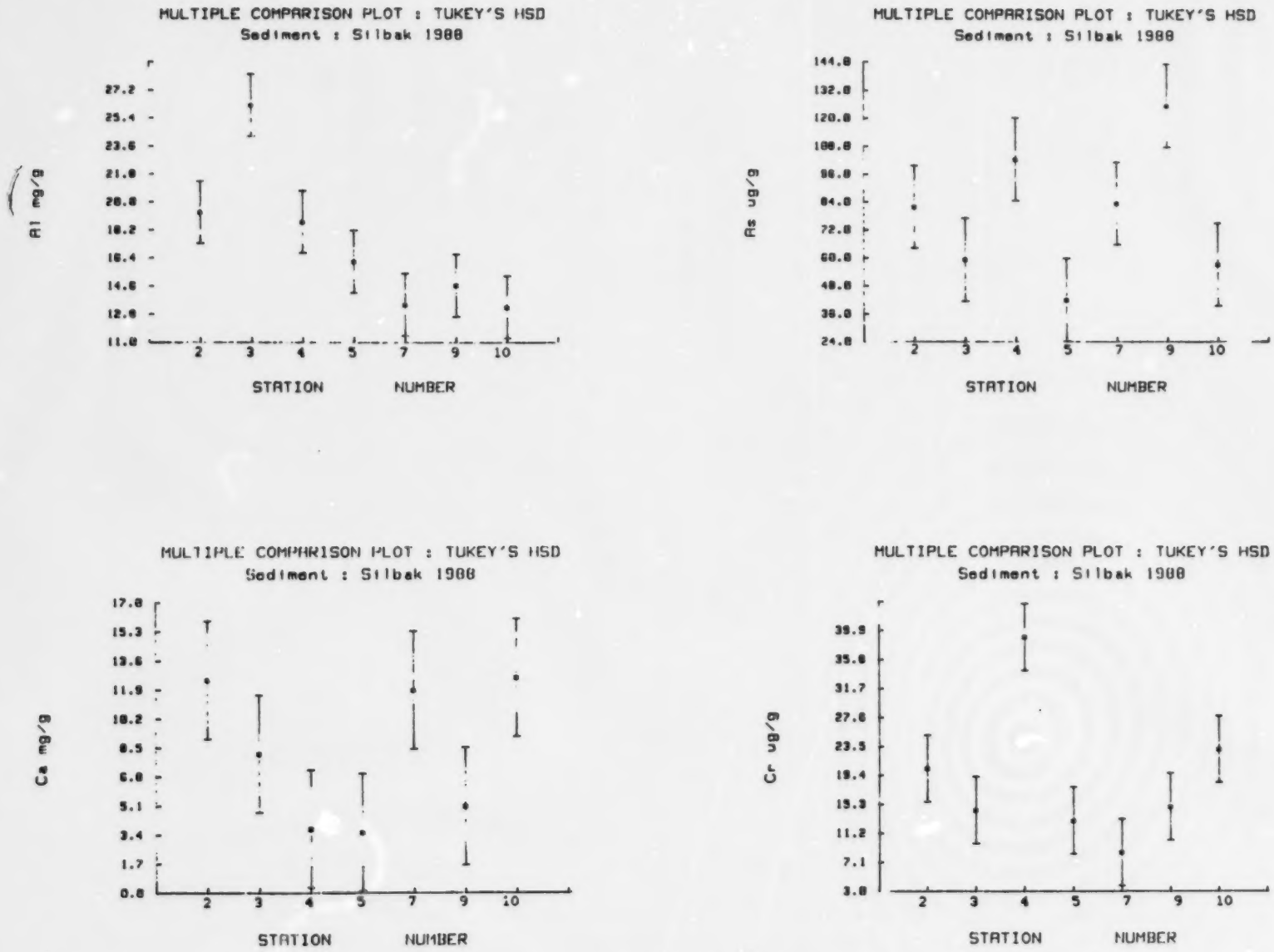
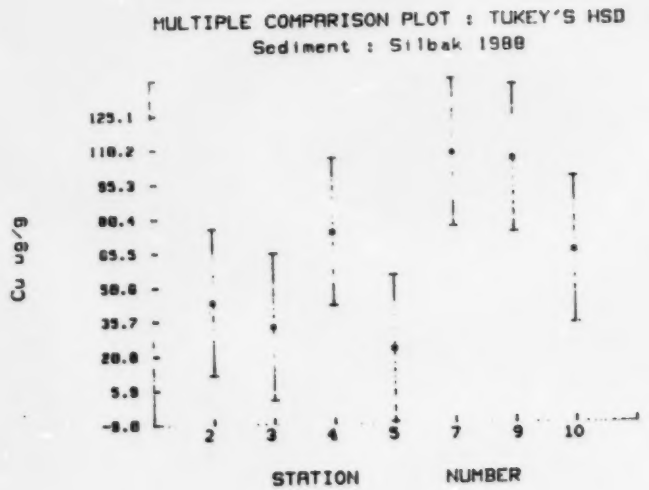
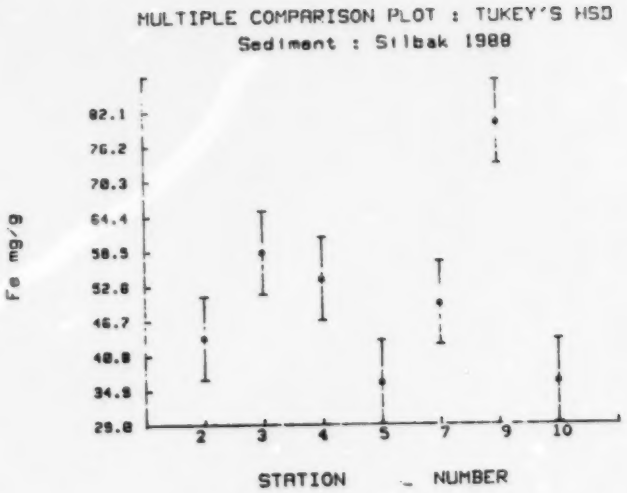
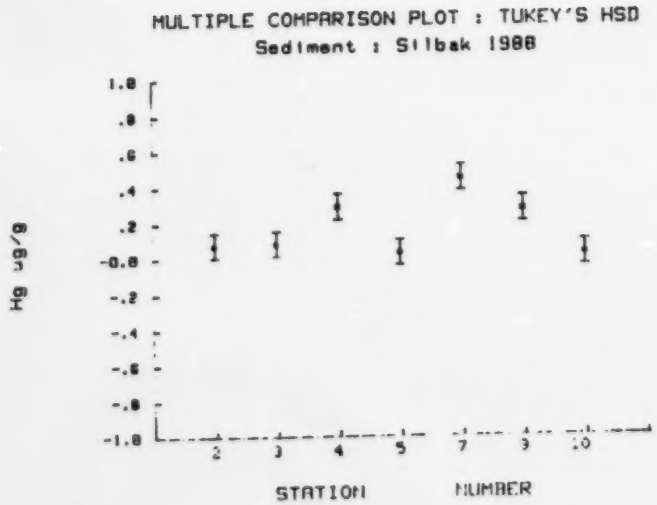


Figure 3 - Sediment Multiple Comparison Plot Silbak 1988 - Al, As, Ca, Cr







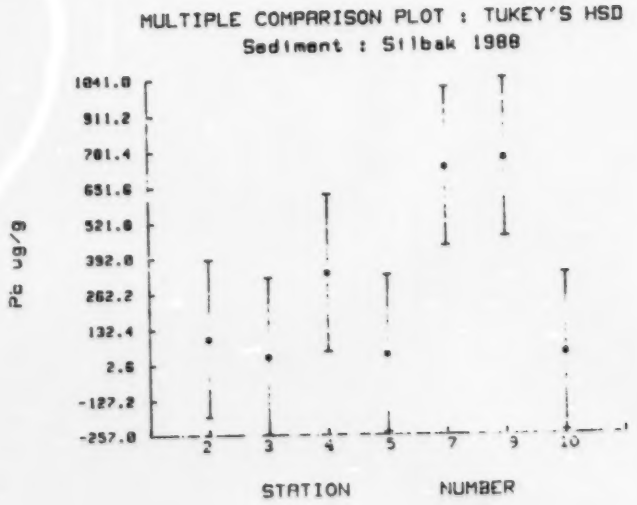
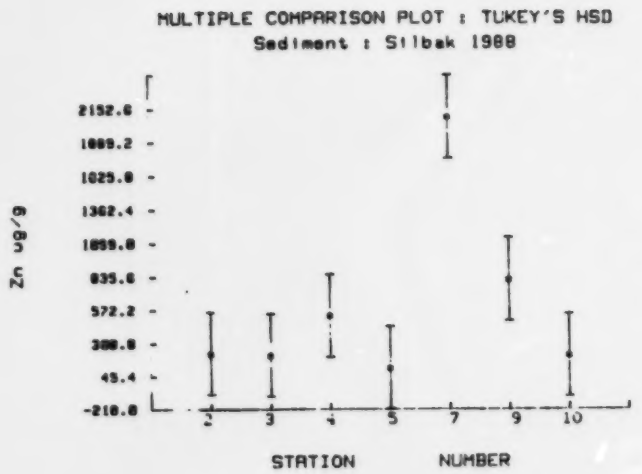
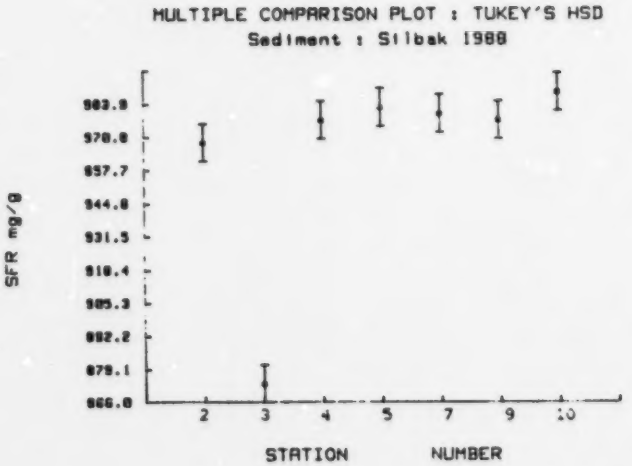


Figure 4 - Sediment Multiple Comparison Plot Silbak 1988 - Cu, Fe, Hg, Pb





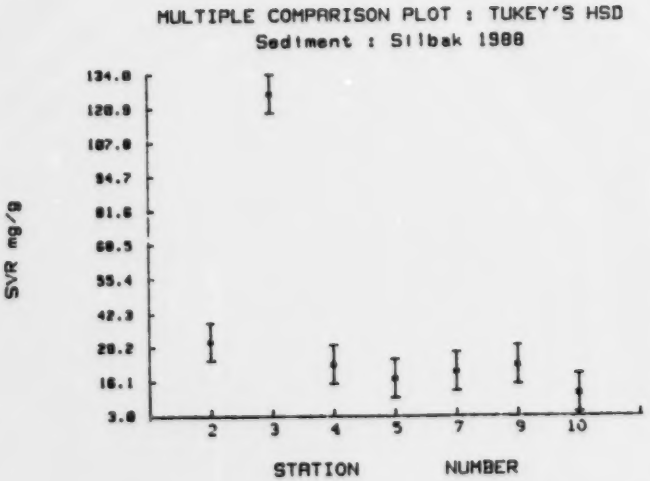


Figure 5 - Sediment Multiple Comparison Plot Silbak 1988 - Zn, SFR, SVR

Table 4

Silbak Sediments (< 150) - Statistical Station Separation
August 9, 1988

Parameter	Station	Separation	Parameter	Station	Separation	Parameter	Station	Separation
Aluminum	10	a	Copper	5	a	Zinc	5	a
	7	a		3	a		10	ab
	9	a		2	ab		3	ab
	5	ab		10	abc		2	ab
	4	b		4	abc		4	ab
	2	b		9	bc		9	b
	3	c		7	c		7	c
Arsenic	5	a	Iron	5	a	SFR	3	a
	10	ab		10	a		2	b
	3	ab		2	ab		4	bc
	2	bc		7	abc		9	bc
	7	bc		4	bc		7	bc
	4	cd		3	c		5	bc
	9	d		9	d		10	c
Calcium	5	a	Mercury	10	a	SVR	10	a
	4	a		5	a		5	ab
	9	ab		2	a		7	ab
	3	abc		3	a		9	ab
	7	bc		9	b		4	ab
	2	c		4	b		2	b
	10	c		7	c		3	c
Chromium	7	a	Lead	3	a			
	5	ab		5	a			
	3	abc		10	a			
	9	abc		2	a			
	2	bc		4	ab			
	10	c		7	b			
	4	d		9	b			

Note : The stations are ranked by the lowest mean. The separation is determined by the overlapping confidence intevals.

Sediment comparisons from last year's survey showed that arsenic sediment content was generally higher in 1988 than in 1987 while cadmium and mercury were consistently lower. The copper, lead and zinc content in the sediments, in 1988, was higher at Station 4 and 9, (respectively Cascade Creek upstream and downstream stations), but were not reduced at Station 7.

Sediments collected at level #4 and #6 showed contamination for various heavy metals. The following values (µg/g) are an average of metal content at level #4 and #6 respectively: As (125 and 93); Cd (192 and 68); Cu (2547 and 703); Hg (4.78 and 1.07); Pb (6948 and 2355); Zn (19275 and 9220). These highly elevated metal values are a relection to the contaminated water quality from the two adits.

REFERENCE

Anon, 1979. Laboratory Manual. Department of the Environment, Environmental Protection Service, Department of Fisheries and Oceans (Pacific Region).

Godin, B. 1988. Baseline Water Quality Monitoring At The Westmin Resources Limited Silbak Premier Project - August 9 1987. Data Report DR-88-06. Environment Canada. Environmental Protection. Pacific and Yukon Region.